REMARKS

I. STATUS OF THE CLAIMS:

Claims 1, 4 – 8, 10 – 12, and 16 – 22 are pending. Claim 21 has been deemed allowable by the Office. No claims have been amended and no new matter has been added.

II. PRIOR ART REJECTIONS:

Claims 1, 4 – 8, and 10 – 12, 16 – 20, and 22 are rejected under 35 U.S.C. § 103(a) as being obvious over GB 1,052,118 (GB '118) in view of US 5,895,639 (Swain) and further in view of US 5,874,658 (Belter). In particular, the Office asserts that GB '118 and Swain each discloses a process for separating HF in the production of a fluoride-containing hydrocarbon by contacting the gaseous mixture with sulfuric acid.

The Office further asserts that it would have been obvious to one skilled in the art to use any known method, such as flash distillation or fractional distillation, to separate the HF from the sulfuric acid. Moreover, the Examiner takes Official Notice that flash distillation and the step of distilling diluted HF to obtain anhydrous HF are known and conventional steps in the art.

A. CLAIMED INVENTION:

Applicants have discovered that anhydrous HF having very low levels of sulfur and tar impurites (the latter expressed in terms of Total Organic Carbon or "TOC") can be separated from azeotropic and nonazeotropic HF/halocarbons mixtures by extracting the HF from the mixture using dilute sulfuric acid, subjecting the extracted HF to flash distillation, and then subjecting the flashed HF to column fractionation. This process surprisingly produces anhydrous HF having a sulfur impurity level of less than about 200 ppm.

B. PRIOR ART REFERENCES

1. GB 1,052,118

GB '118 discloses a process for separating HF from a gaseous mixture produced by fluorinating a halocarbon with HF, wherein the mixture is contacted with aqueous sulfuric acid of at least 70 wt. % concentration to absorb the HF. GB '118 further teaches that the absorbed HF can be recovered via a stripping operation.

2. US 5,874,658 (Belter)

Belter discloses that an alkanolamine solution can be used as a phase separation additive to separate HF from saturated fluorinated aliphatic hydrocarbons. The HF can be recovered from the HF/alkanolamine mixture by distillation. Belter also discloses that 100% sulfuric acid or < 100% sulfuric acid can be used in lieu of the alkanolamine solution.

3. US 5,895,639 (Swain)

Swain, which is assigned to the same assignees as the present application, discloses a process for separating HF from an azeotropic mixture of HF and fluorocarbons using concentrated sulfuric acid as an extraction agent. According to Swain, the HF can be separated from the sulfuric acid via distillation.

C. ARGUMENTS

The cited references, alone or in combination, fail to disclose a process involving the combination of flash distillation followed by column fractionation. It is incontrovertible that, to establish a *prima facie* showing of obviousness, the cited reference, or combination of references, must include each and every limitation of the claimed invention. MPEP 2143. Here, the claimed invention, specifically recites that the method for recovering anhydrous HF includes the step of subjecting extracted HF to flash distillation followed by column fractional distillation.

Applicants have unexpectedly found that flashing an HF and sulfuric acid mixed stream and then fractionating the resulting HF distillate dramatically decreases the level of sulfur impurities in the HF product. As demonstrated in the attached Rule 1.132 Declaration by Hseuh Tung, one skilled in the art would have predicted that, based upon the boiling points of HF and sulfuric acid, column fractionation alone would remove substantially all sulfur impurities from an HF / sulfuric acid mixture. However, a portion of the sulfuric acid unexpectedly appears to decompose into one or more sulfur compounds before or during fractionation and that these sulfur compounds have boiling points less than that of HF. As a result, these sulfur impurities remain in the anhydrous HF distillate after a simple fractionation. Applicants have unexpectedly found that flashing the HF and sulfuric acid mixed stream prior to fractionation minimizes the sulfur compound decomposition and, thus, dramatically decreases the level of sulfur impurities in the final anhydrous HF product.

The Examiner does not allege that the cited references teach a process involving flashing followed by fractional distillation. Instead, the Office takes Official Notice that flash distillation and the step of distilling a diluted HF to obtain anhydrous HF are known and conventional steps in the art. Notwithstanding the Office's Official Notice, Applicants respectfully traverse the rejection because the claimed *combination* of flashing followed by column fractionation is not taught by either of the references and, as shown in Tung's Declaration, such a combination produces the unexpected result of substantially reducing the concentration of sulfur impurities in anhydrous HF.

IV. CONCLUSION

In view of the proposed claim amendments and the arguments presented above, the present application is believed to be in condition for allowance and an early notice thereof is earnestly solicited. The Office is invited to contact the undersigned counsel in order to further the prosecution of this application in any way.

Respectfully submitted,

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